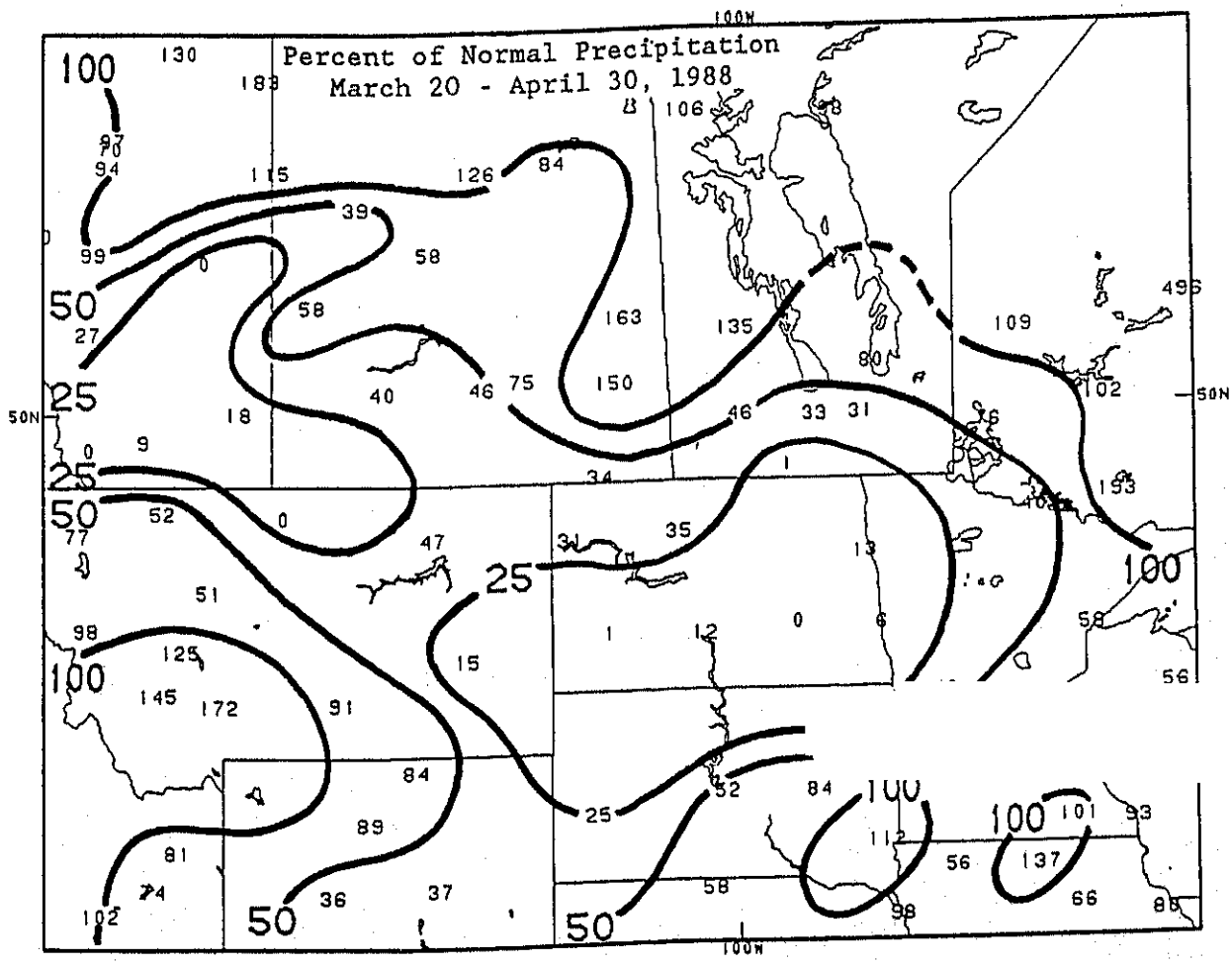
CLIMATE ANALYSIS CENTER

# WEEKLY CLIMATE BULLETIN

No. 88/18 Washington, DC April 30, 1988




PRECIPITATION NORMALLY INCREASES IN THE SPRING AND REACHES A MAXIMUM DURING THE SUMMER MONTHS IN THE NORTHERN GREAT PLAINS, UPPER MIDWEST, AND SOUTHERN CANADA. SO FAR THIS SPRING, HOWEVER, PRECIPITATION HAS BEEN RATHER DEFICIENT THROUGHOUT MOST OF THE AREA AS THE GROWING SEASON GETS UNDERWAY. REFER TO THE SPECIAL CLIMATE SUMMARY FOR FURTHER DETAILS.

NOAA - NATIONAL WEATHER SERVICE - NATIONAL METEOROLOGICAL CENTER

# GLOBAL CLIMATE HIGHLIGHTS

## *MAJOR CLIMATE EVENTS AND ANOMALIES AS OF SEPTEMBER 19, 1992*

*1. Alaska and Western Canada:*

### COLD WEATHER SHIFTS WESTWARD.

Temperatures averaged as much as 9°C below normal in Alaska while departures in western Canada approached –8°C [11 weeks].

*2. Minnesota and Iowa:*

### TORRENTIAL RAINS CAUSE FLOODING.

Southern Iowa was inundated by 300 to 400 mm of rain when numerous thunderstorms developed along a stalled front. According to press reports, serious flooding closed schools, businesses, and roads (see page 2). In addition, precipitation amounts of 50 to 240 mm drenched southern Minnesota, northern Iowa, and southwestern Wisconsin [Episodic Event].

*3. East–Central South America:*

### DRIER WEATHER PREVAILS.

Generally less than 30 mm of precipitation was observed in most of the region, but isolated showers dumped as much as 110 mm of rain on southern parts of the region [4 weeks].

*4. Finland and Northwestern Russia:*

### WET SPELL ENDS.

Near normal conditions returned to the area; however, six–week moisture surpluses still ranged from 50 to 130 mm [Ended at 10 weeks].

*5. Southern and Eastern Europe:*

### STILL VERY DRY.

Up to 50 mm of precipitation fell in the Alps and parts of Russia; however, little or no rain was measured across the southern tier of the continent. Precipitation shortfalls since early August approached 130 mm in parts of Austria and sections of former Yugoslavia [24 weeks].

*6. Western Sahel:*

### RAINS BRING LIMITED RELIEF.

Up to 90 mm of rain fell on the central parts of Togo and Benin, but scattered areas elsewhere received little or no precipitation, and many countries reported six–week moisture deficits of 200 to 700 mm with the largest departures occurring in Guinea [9 weeks].

*7. Pakistan and Western India:*

### FLOODING ABATES AS RAINFALL DIMINISHES.

Although isolated locations received up to 50 mm of rain, generally light precipitation (10 to 20 mm) fell in the area, allowing last week's floodwaters to recede in northwestern India and the northern half of Pakistan. Moisture surpluses since early August ranged from 150 to 300 mm [8 weeks].

*8. Interior Southeastern China:*

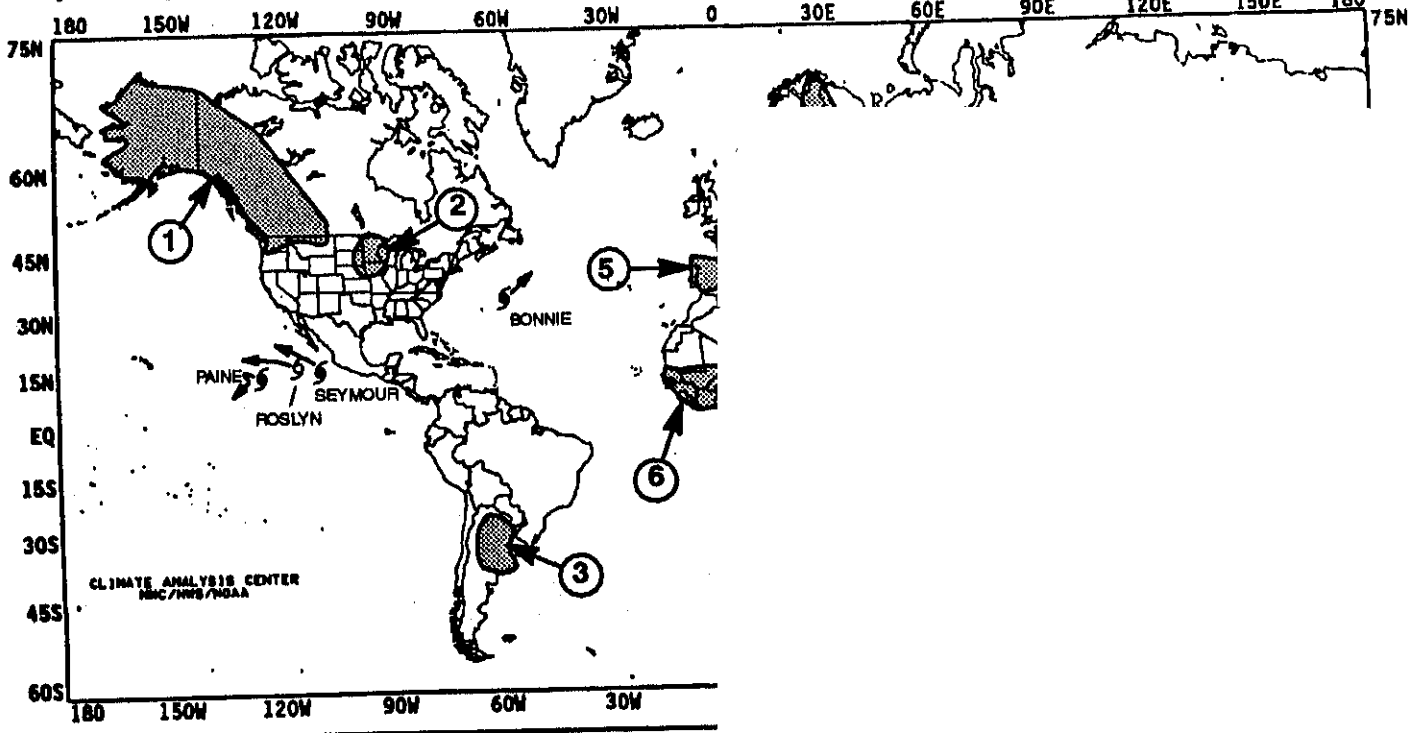
### DRY CONDITIONS EASE.

Up to 70 mm of rain brought some relief from extended dryness; however, scattered locations received less than 30 mm. Six–week precipitation deficits approached 150 mm at some locations [11 weeks].

*9. Northern Philippines, Taiwan, and Coastal Southeastern China:*

### DRY WEATHER BRINGS MORE RELIEF.

Only light rains (up to 30 mm) dampened Taiwan and the coast of China while as much as 90 mm drenched the northern Philippines. Although six–week precipitation excesses were generally below 70 mm in China, parts of Taiwan accumulated surpluses of up to 570 mm since early August [5 weeks].




**EXPL**

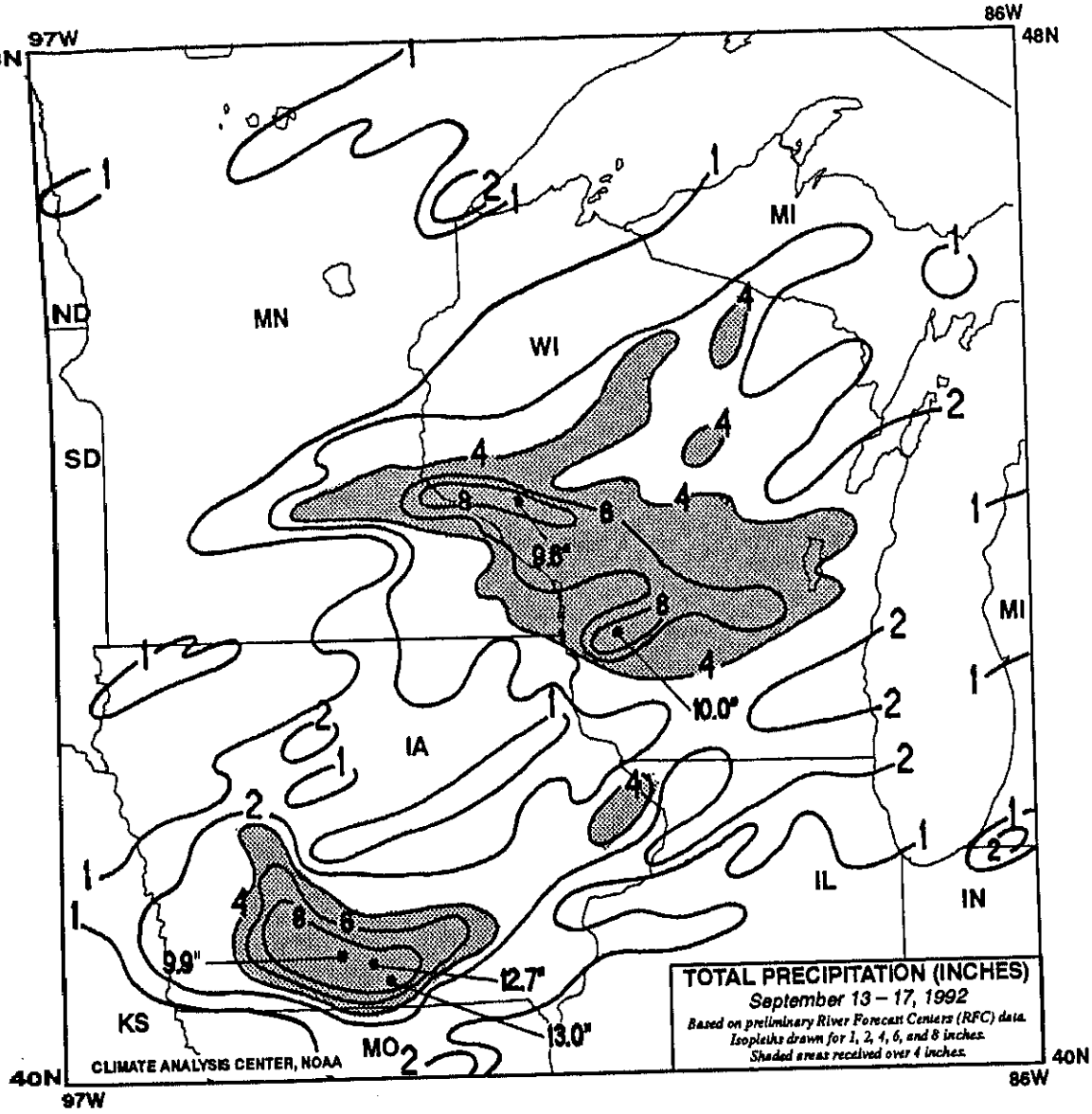
TEXT: Approximate duration of anomalies is in brackets. Precipitati
MAP: Approximate locations of major anomalies and episodic eve
temperature anomalies, four week precipitation anomalies, long–tern

# NORTH AMERICAN CLIMATE HIGHLIGHTS FEATURE

## FLOODING IN IOWA, MINNESOTA, AND WISCONSIN

*SEPTEMBER 13 – 17, 1992*

*Information from the Office of Hydrology, National Weather Service*




*Strong, nearly stationary thunderstorms produced torrential rains over a sizable portion of west–central, southwestern, and south–central Iowa. The rains began during the day on Monday, September 14 and continued through the morning hours of Tuesday, September 15. The heaviest rains fell generally between sundown Monday evening and sunrise Tuesday morning. Several counties in south–central Iowa were hardest hit by the rains. The thunderstorms formed south of a slow–moving cold front. The official observed rainfall included as much as 12 inches at Derby. Numerous locations across much of southern Iowa reported over six inches of rain (see above). Unofficial amounts ranged up to 16 inches at Van Wert in northern Decatur County. All of this rain produced substantial flash flooding, along with significant river flooding.*

*Several larger rivers in Iowa experienced major, and in some cases, record flooding. Record crests were reached along a stretch of the Chariton River (at and near Chariton) and along a portion of the South Fork of the Chariton (at and near Promise City). Crests were as much as 15 feet above flood stage along these two rivers, breaking old records by more than three feet at some locations. Additionally, the Thompson River (locally known as the Grand River) crested very close to the 107–year–old record at Davis City. Numerous other rivers in southern Iowa reached or exceeded their flood stages. Based on information received at this time, it appears as though the most serious consequences were numerous washed out bridges and roads and the closure of many other roads, including major highways.*

*Flash flooding, urban and small–stream flooding, and some river flooding occurred in small portions of west–central Wisconsin and southeastern Minnesota after very heavy rains during this same general time period. Amounts of up to 12 inches were reported at isolated locations. Some mudslides were reported, though no reports of major impacts were received.*

# UNITED STATES WEEKLY CLIMATE HIGHLIGHTS

## *FOR THE WEEK OF SEPTEMBER 13–19, 1992*

Slow–moving thunderstorms dumped torrential rain across southern Iowa, southeastern Minnesota, and southwestern Wisconsin, washing out roads and bridges, submerging cropland, and cutting off entire communities. On Monday and Tuesday, powerful thunderstorms developed south of a stationary front extending across the middle Missouri Valley into the upper Great Lakes, inundating nearly 3,800 square miles of southern Iowa with heavy rain and forcing many residents from their homes. Measurements of 6 and 10 inches of rain in 24 hours were common with Van Wert in south–central Iowa reporting an unofficial 16 inches. Extensive damage to corn and soybeans that had been expected to produce near–record yields were reported. The Chariton River at Chariton, IA, reached its highest level on record. Dozens of bridges were destroyed and roads covered with up to 8 feet of water in Adams, Clarke, Decatur, Lucas, Union, and Wayne counties, with severe flooding also affecting Monroe, Marion, and Wapello counties. Up to 8 inches of rain fell from Monday to Wednesday over southwestern Wisconsin, forcing the Trempealeau and Kickapoo rivers and numerous creeks out of their banks. Serious flooding was reported in Jackson, Richland, Trempealeau, Crawford, and Vernon counties. Up to 9 inches of rain soaked southeastern Minnesota Tuesday night and Wednesday morning with the southern suburbs of Minneapolis–St. Paul particularly hard hit. Interstate 35 south of Minneapolis remained under standing water as much as 5 feet deep as the Vermilion River overflowed its banks. Severe flooding plagued Dakota, Scott, and Hennepin counties. Showers lingered over the western Corn Belt until Friday when the front moved southeastward, aggravating the flooding. Elsewhere, unseasonably cool weather persisted over the Pacific Northwest with departures down to –8°F while hot humid conditions remained through much of the week south of the stationary front where apparent temperatures topped 95°F in the central Plains and across much of the Deep South. In Alaska, early season storms dumped heavy snow across central and southeastern portions of the state. Gulkana was blanketed with a foot of snow, a record total for the month of September.

As the week commenced, a strong frontal system moved across the northern and central Rockies and northern Plains into the upper Mississippi Valley and central Plains. Showers and thunderstorms developed along and ahead of the system from the middle Missouri Valley to the upper Great Lakes. Meanwhile, onshore winds brought showers and thunderstorms to the southern Atlantic and western Gulf coasts. On Monday and Tuesday, the system stalled and strong storms developed to its south, barraging southern Iowa to the upper Great Lakes with heavy rain. Elsewhere, a large high pressure system brought clear skies and fair weather to the East while showers were widespread over the Southwest and Pacific Northwest. In central Alaska, portions of the Tanana Valley and Alaskan range received record monthly snowfall with 37.6 inches reported at the Denali National Park. In Hawaii, locally heavy rain caused minor flooding over windward portions of the Big Island.

The heavy rains continued through mid–week in the upper Midwest, with severe thunderstorms accompanied by large hail and tornadoes roaring across eastern North Dakota and northern Minnesota on Wednesday. On Friday, the cold front moved southeastward, spreading showers and thunderstorms to the Atlantic and Gulf coasts. Heavy amounts of rain drenched portions of the Ozark Plateau, Tennessee Valley, and southern Appalachians. In Alaska, heavy snow fell across southeastern portions with the Copper River Basin receiving record monthly amounts. Unseasonably cool air followed the storm as a number of daily record lows were set on Wednesday with single digit temperatures reported in central Alaska.

According to reports received form the River Forecast Centers, the week's heaviest rains (up to 13 inches) were associated with the stalled frontal system across the middle Missouri and upper Mississippi Valleys and upper Great Lakes. Scattered totals of 2 or more inches were also recorded over the southeastern Plains, the western Ozarks, the Tennessee Valley, the southern Appalachians, the central Gulf coast, the Florida peninsula, the Cascade Range of northern Oregon, the Alaskan panhandle, and the Big Island of Hawaii. Light to moderate amounts were measured in the Rockies, the desert Southwest, the eastern Great Basin, and the remainders of the Pacific Northwest, Alaska, Hawaii, and the nation east of the Rockies. Little or no precipitation fell on the western Great Basin and California.

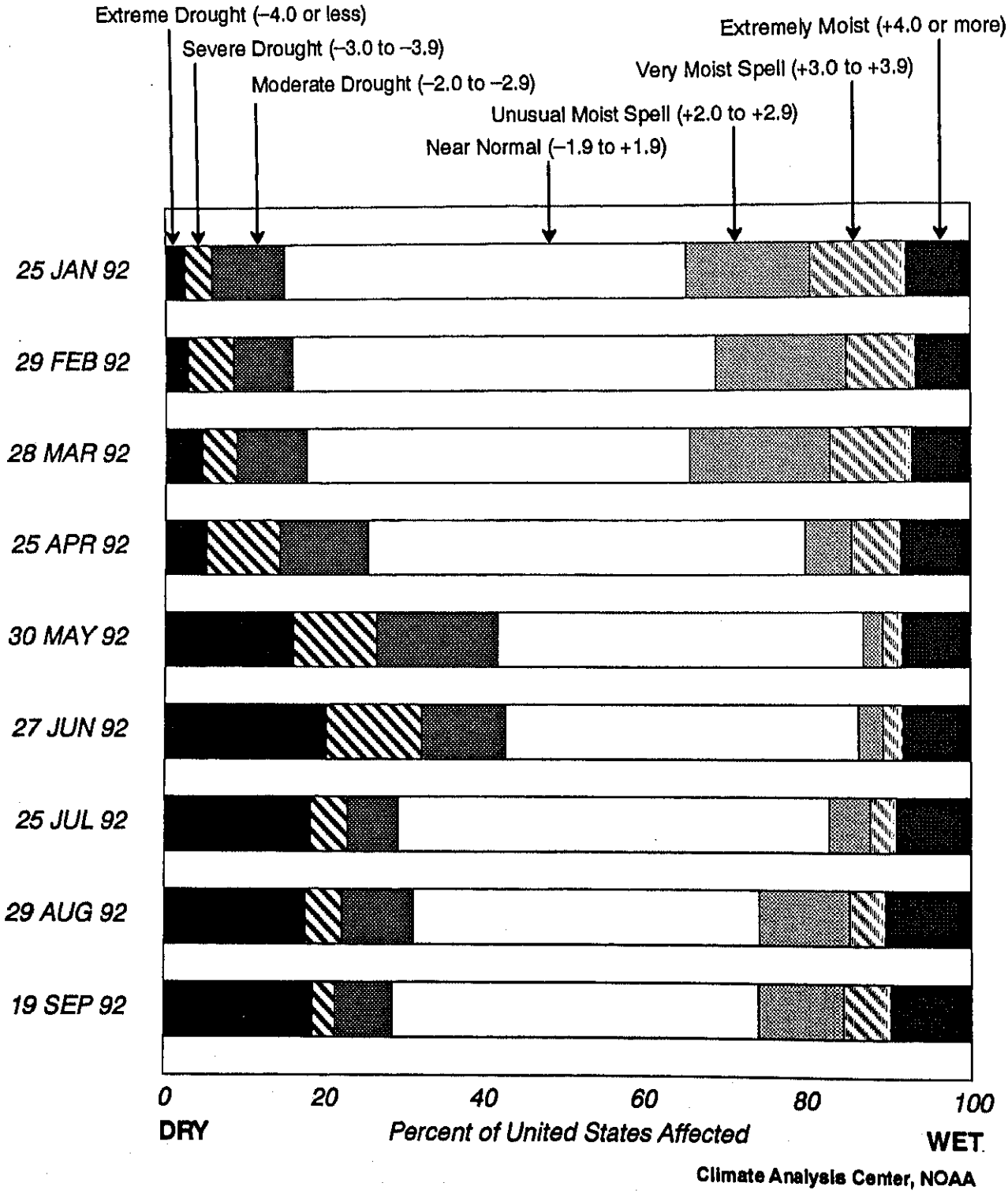
Warmer than normal conditions prevailed from California to the upper Mississippi Valley and the Atlantic coast and in Hawaii. Weekly departures of greater than +6°F were observed in the desert Southwest, central Plains, and northern New England.

In the contiguous United States, unseasonably cool weather was limited to the Northwest, northern Rockies, northern Plains, and along portions of the middle and southern Atlantic coast. Weekly departures of less than –7°F were reported only in the northern Intermountain West. In Alaska, abnormally cold conditions persisted with weekly departures as low as –16°F in central portions of the state.

# UNITED STATES CLIMATE HIGHLIGHTS FEATURE

## PERCENT OF UNITED STATES AFFECTED BY A WET SPELL OR DROUGHT, BASED ON THE PALMER INDEX

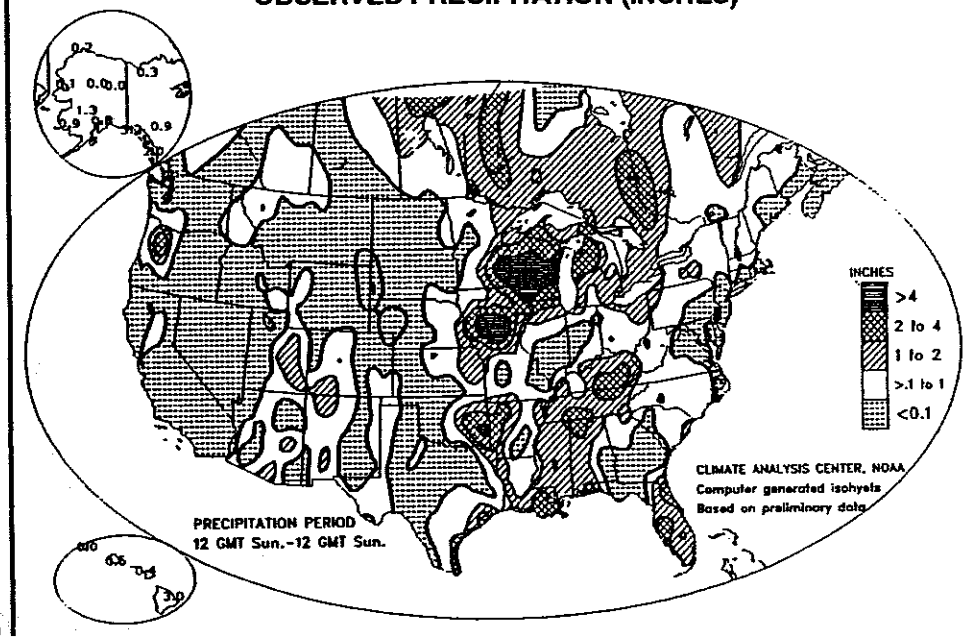
*January through September 1992*



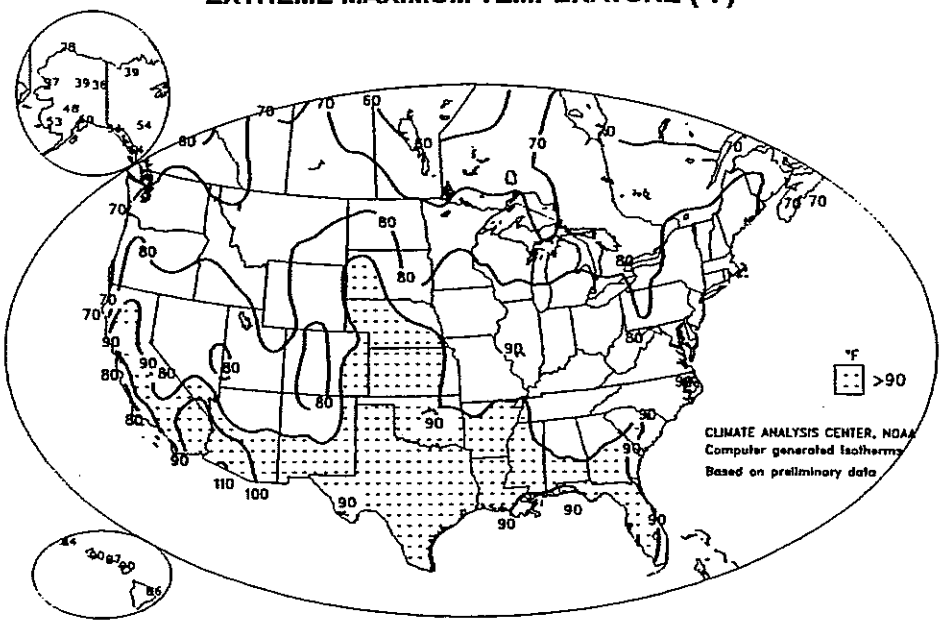

Climate Analysis Center, NOAA

**Percent of Area Affected by Wet Spells and Drought.** *Based on a preliminary Palmer Drought Severity Index at –4, –3, –2, +2, +3, and +4, computed by climate divisions. Dry conditions are on the left and wet conditions are on the right.*

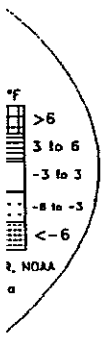
## OBSERVED PRECIPITATION (INCHES)



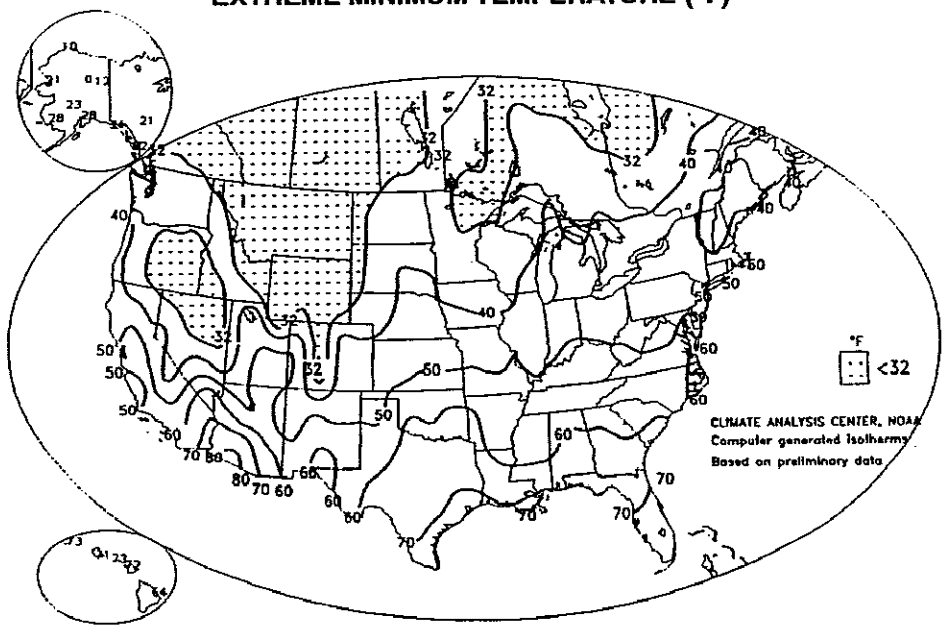

## EXTREME MAXIMUM TEMPERATURE (°F)




## MPERATURE
F)

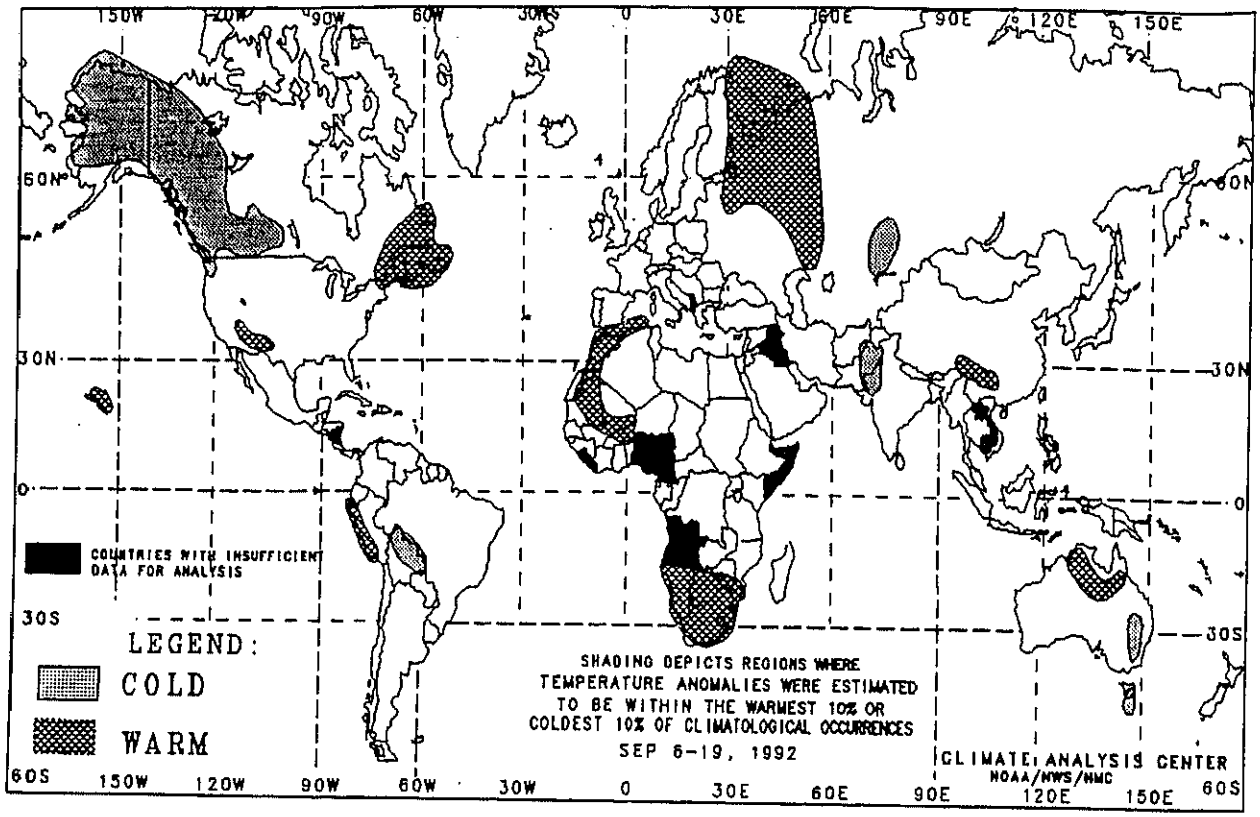



## EXTREME MINIMUM TEMPERATURE (°F)



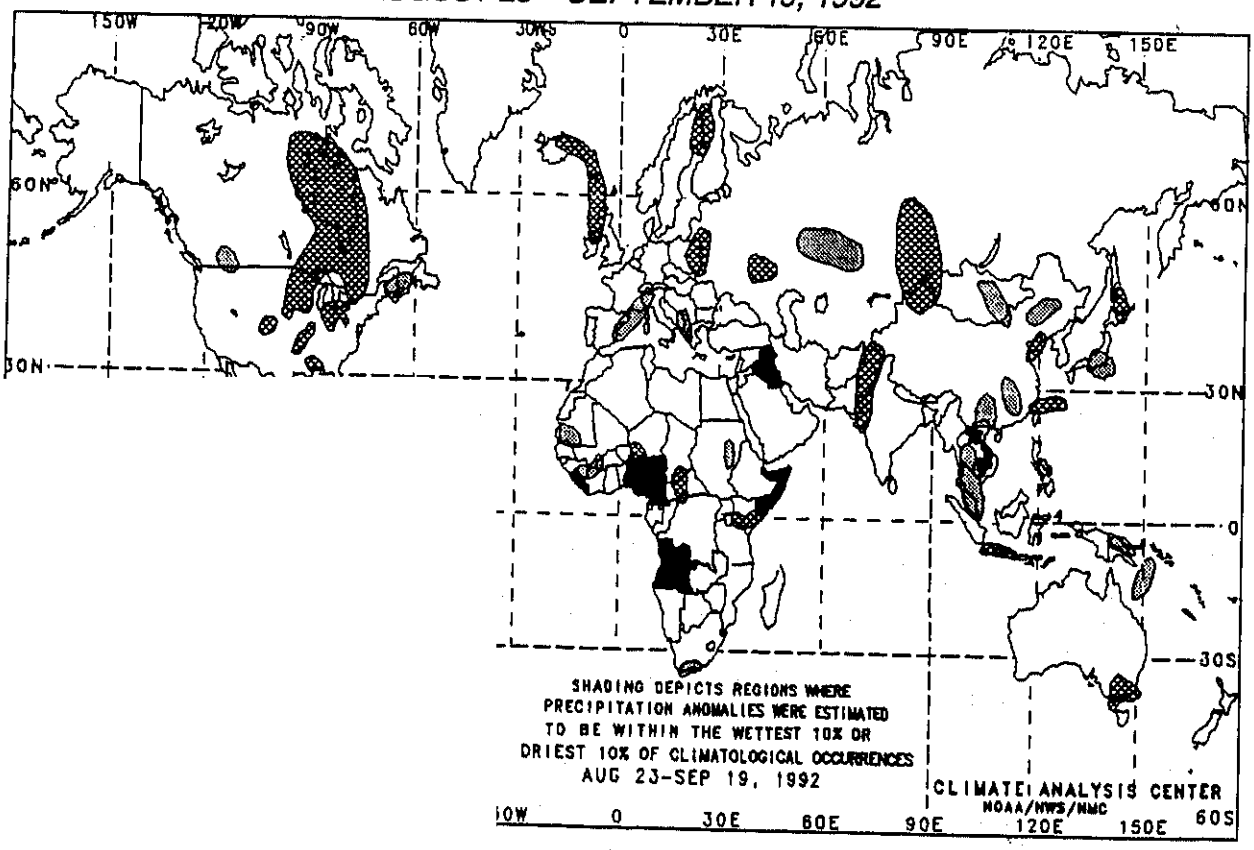
# 2–WEEK GLOBAL TEMPERATURE ANOMALIES

*SEPTEMBER 6 – 19, 1992*



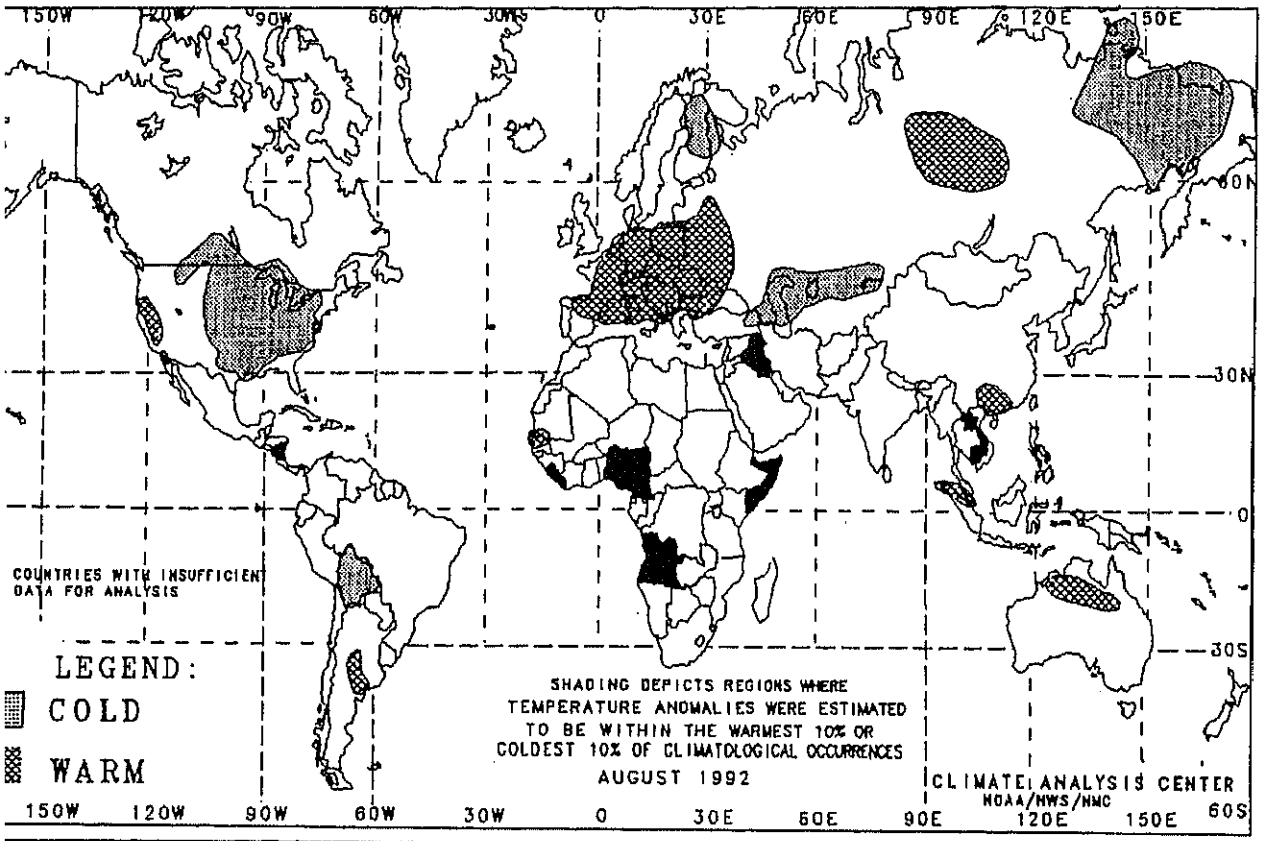

# 4–WEEK GLOBAL PRECIPITATION ANOMALIES

*AUGUST 23 – SEPTEMBER 19, 1992*



# MONTHLY GLOBAL TEMPERATURE ANOMALIES

*AUGUST 1992*

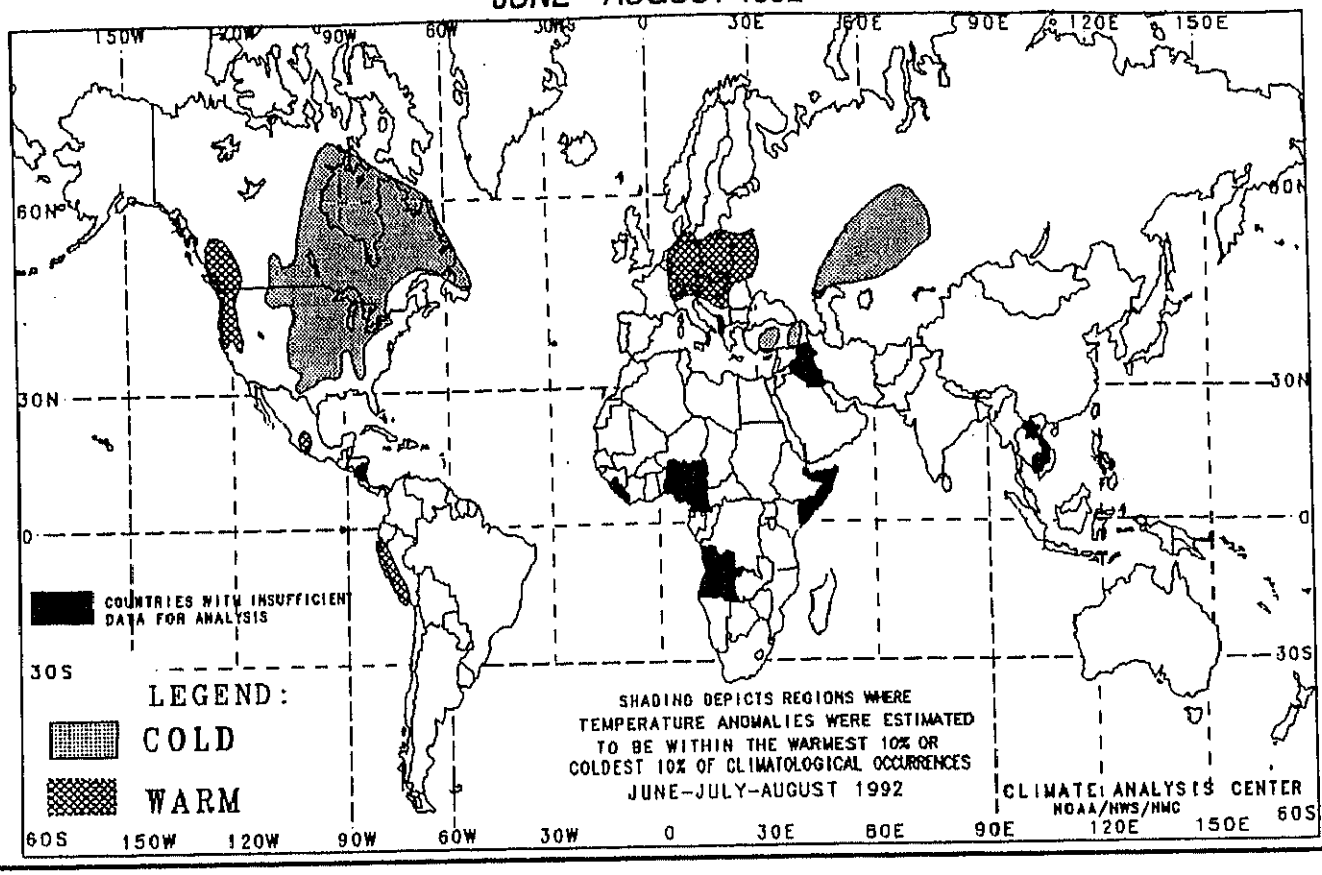



# MONTHLY GLOBAL PRECIPITATION ANOMALIES

*AUGUST 1992*

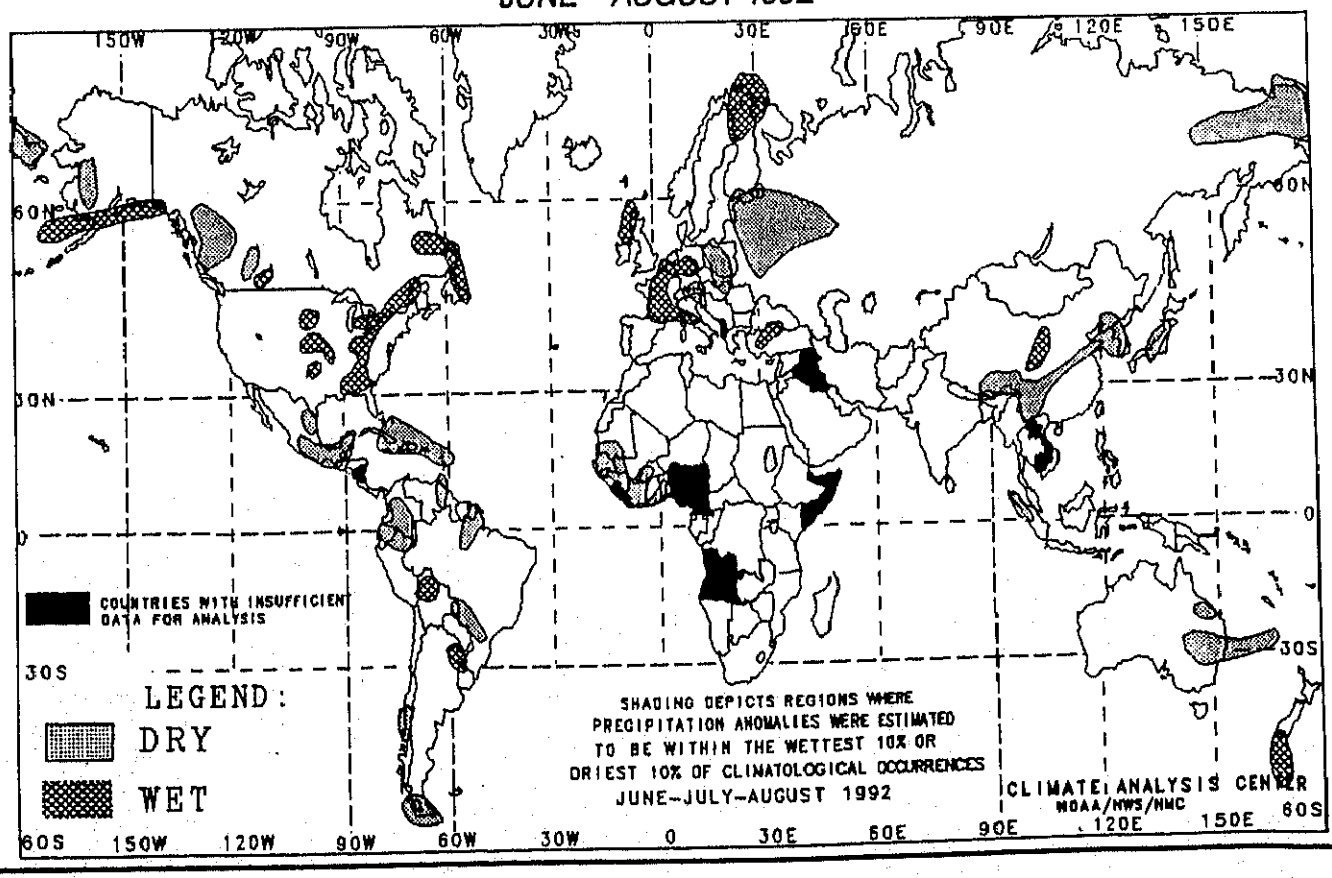
# THREE–MONTH GLOBAL TEMPERATURE ANOMALIES

*JUNE – AUGUST 1992*



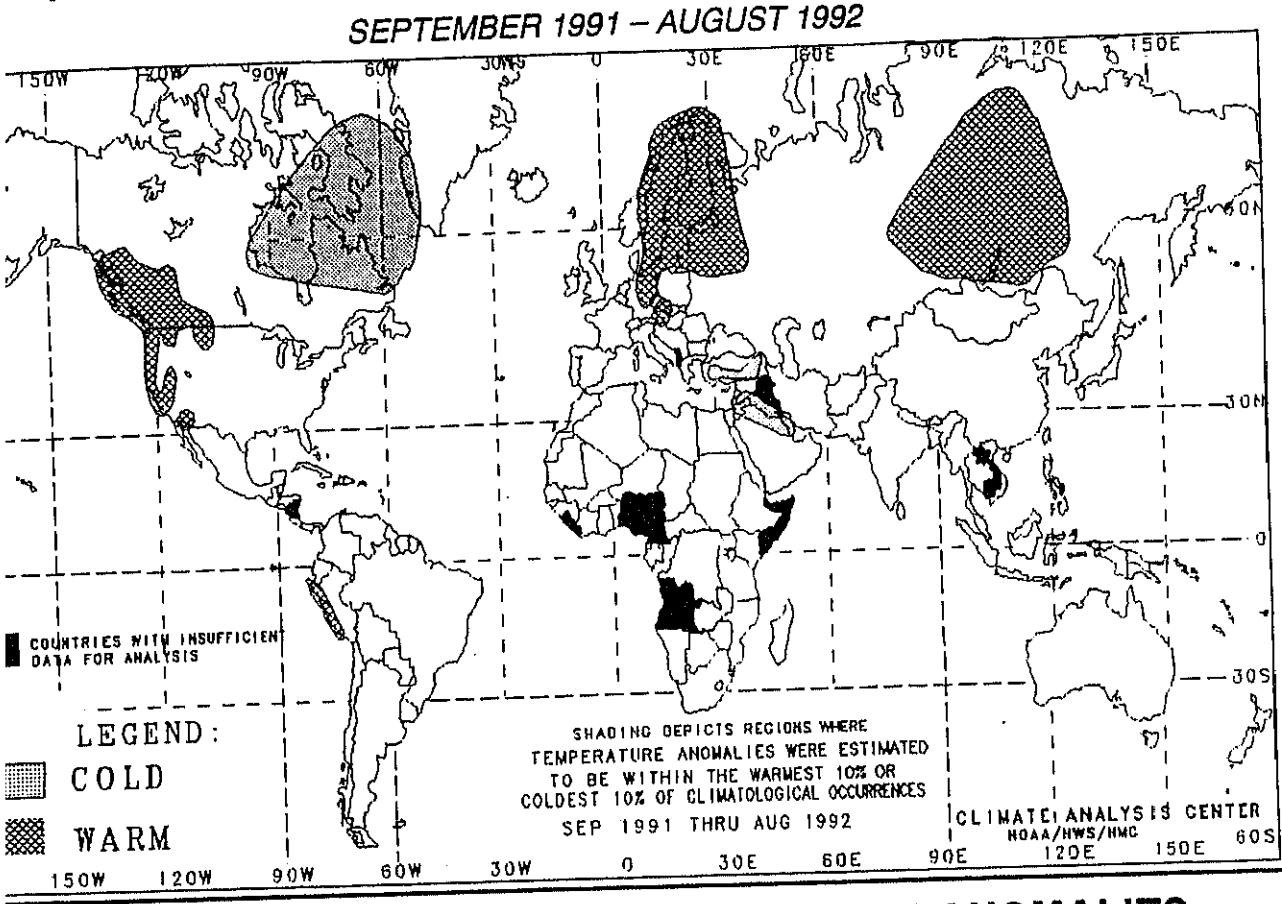

# THREE–MONTH GLOBAL PRECIPITATION ANOMALIES

*JUNE – AUGUST 1992*



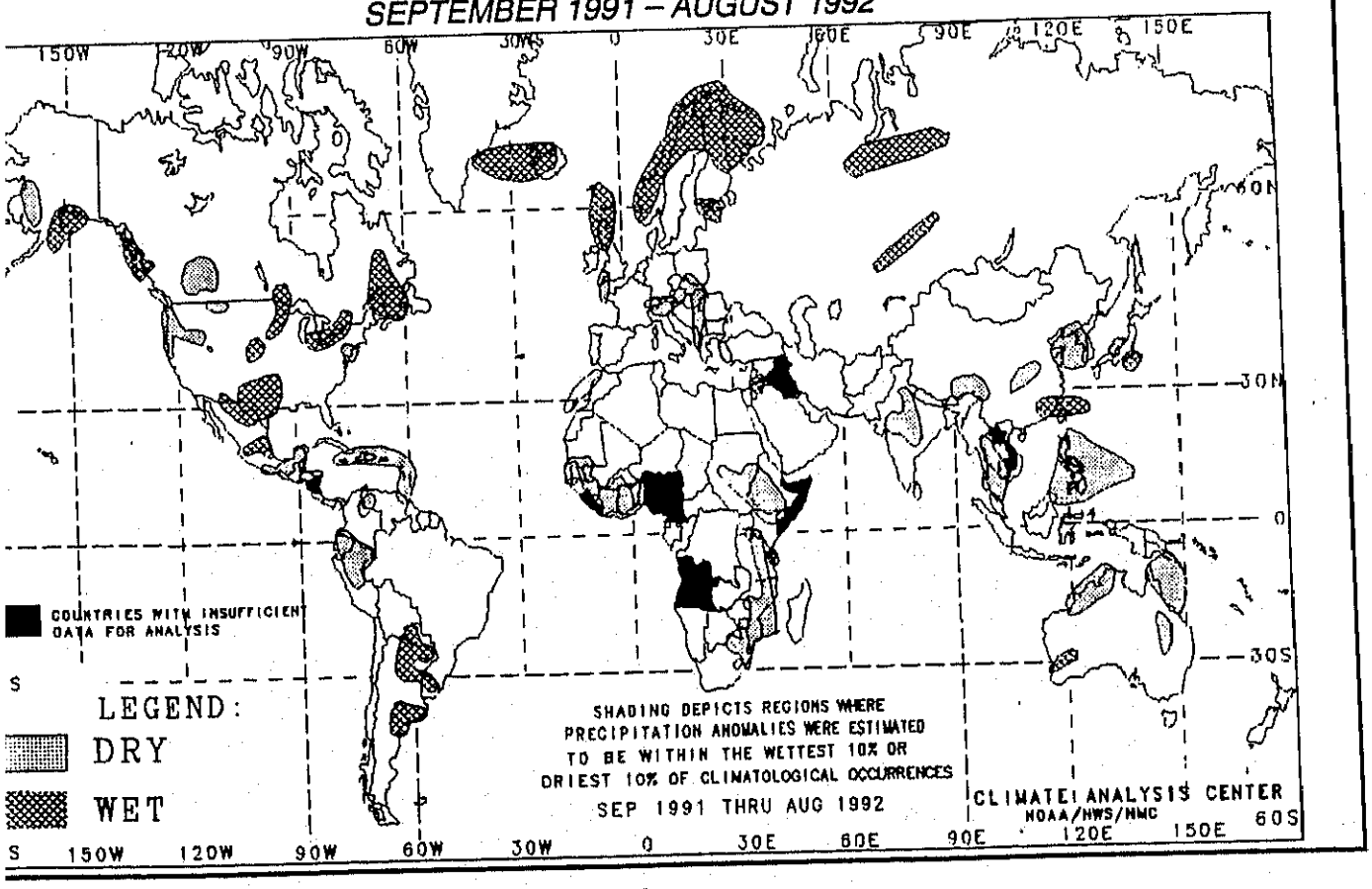
# TWELVE–MONTH GLOBAL TEMPERATURE ANOMALIES

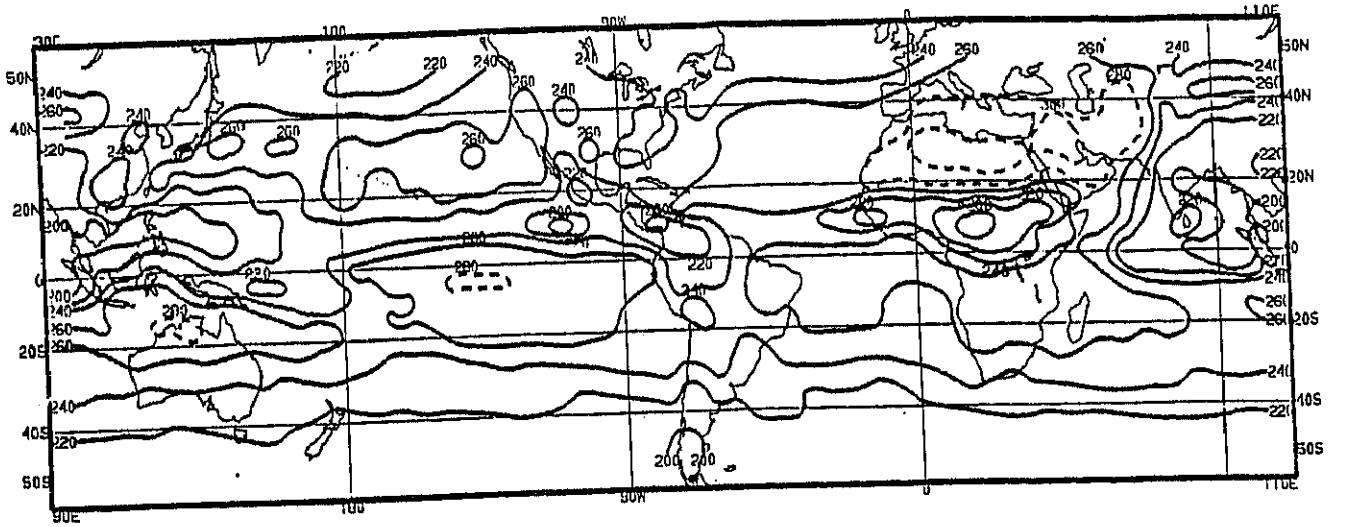
*SEPTEMBER 1991 – AUGUST 1992*




# TWELVE–MONTH GLOBAL PRECIPITATION ANOMALIES

*SEPTEMBER 1991 – AUGUST 1992*



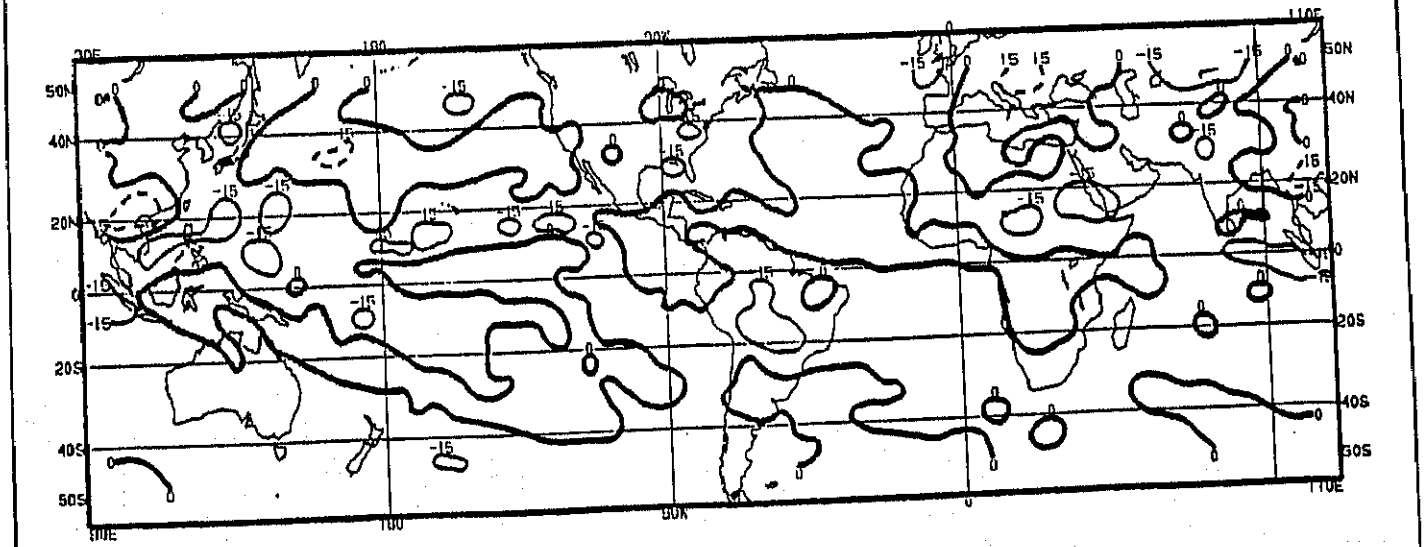


Monthly Mean Outgoing Long Wave Radiation (OLR) for August 1992

## EXPLANATION

The mean monthly outgoing long wave radiation (OLR) as measured by the NOAA–9 AVHRR IR window channel by NESDIS/SRL (top). Data are accumulated and averaged over 2.5° areas to a 5° Mercator grid for display. Contour intervals are 20 $Wm^{-2}$, and contours of 280 $Wm^{-2}$ and above are dashed. In tropical areas (for our purposes 20°N – 20°S) that receive primarily convective rainfall, a mean OLR value of less than 200 $Wm^{-2}$ is associated with significant monthly precipitation, whereas a value greater than 260 $Wm^{-2}$ normally indicates little or no precipitation. Care must be used in interpreting this chart at higher latitudes, where much of the precipitation is non–convective, or in some tropical coastal or island locations, where precipitation is primarily orographically induced. The approximate relationship between mean OLR and precipitation amount does not necessarily hold in such locations.

The mean monthly outgoing long wave radiation anomalies (bottom) are computed as departures from the 1979 – 1988 base period mean. Contour intervals are 15 $Wm^{-2}$, while positive anomalies (greater than normal OLR, suggesting less than normal cloud cover and/or precipitation) are dashed and negative anomalies (less than normal OLR, suggesting greater than normal cloud cover and/or precipitation) are solid.



Monthly Mean Outgoing Long Wave Radiation (OLR) Anomaly for August 1992

# SPECIAL CLIMATE SUMMARY

*Analysis and Information Branch*
*Climate Analysis Center, NMC*
*National Weather Service, NOAA*

## UPDATE ON THE 1992 INDIAN MONSOON

Since the last review on the 1992 Indian monsoon season (see Weekly Climate Bulletin #92/29 dated July 18, pages 7–8), a resurgent monsoon dropped widespread and abundant rains on much of central, northwestern, and southwestern India, and across much of Pakistan (Figure 1). The ample mid– to late summer rainfall eased or alleviated early–season dryness across much of central and western India and southern Pakistan, bringing seasonal totals close to or above normal (front cover). The heavy downpours, however, also generated severe, and in some instances, catastrophic flooding in portions of the aforementioned areas, especially during early September.

During mid– to late July, heavy rains fell on western India's Gujarat state (see WCB #92/30, page 2), and then again during July 28– August 2, also encompassing southern Pakistan's Sindh Province. According to press reports, the rains in Sindh Province generated flooding that took dozens of lives, caused extensive property and agricultural damage, and left thousands homeless. More heavy rains during mid–August dumped over 150 mm in 12 hours on Karachi, overflowing local rivers and causing additional problems. Elsewhere, widespread and generous rains fell across the remainder of India and Pakistan during late July and most of August, with the exception of light rains across southern India's Tamil Nadu state.

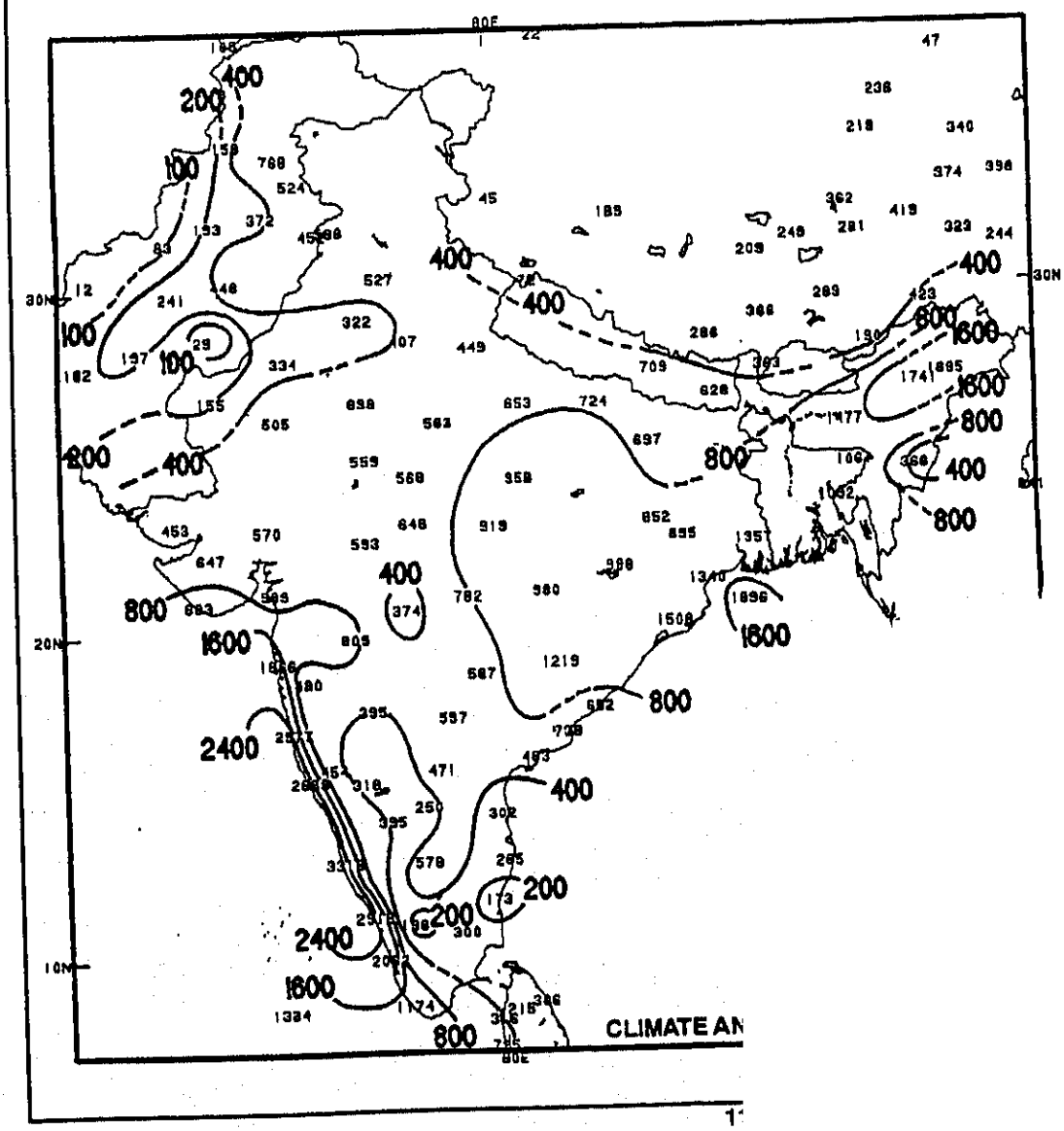



**Figure 1.** May 1 – September 19, 1992 (142 days) total precipitation (mm). *Isohyets are drawn for 100, 200, 400, 800, 1600, and 2400 mm, and stations required at least 113 days (80%) for inclusion. Precipitation amounts general-*

ording to the Indian Meteorological Department (IMD), the June–August 1992 rainfall was 92% of the normal monsoon during the first three monsoon months (starting in June), 27 of 35 meteorological divisions in India received normal (between rainfall, two had excess, and six had deficient rains. The IMD stated that the spread of the monsoon has been uncharacteristic, rains in arid regions while normally wet areas are facing a near–drought. For example, surplus rains have fallen on the western of Rajasthan and neighboring arid Gujarat, but Cherrapunji, the wettest place in the world, measured only 430 cm of rain versus of 581 cm. Compared to last year's monsoon (Figure 2), the 1992 monsoon should greatly differ in western and northwestern h wetter this year) and extreme southeastern India (wetter last year – barring any heavy late September rains).

the month of September progressed, torrential downpours inundated sections of northeastern Afghanistan, northern Pakistan, rn India, producing catastrophic flooding. According to press reports, flash floods in the Afghan Hindu Kush mountains north of Sep. 3 caused a nine meter high tidal surge down three river valleys, taking hundreds, possibly thousands, of lives.

ther east, heavy rains that commenced on Sep. 8 in northwestern India and northern Pakistan continued for the next 2–3 days, ows in the mountains that feed the region's larger rivers. The rains also caused landslides in northern valleys. In order to diminish al for unprecedented downstream flooding along the Indus River in Sindh Province in southern Pakistan, troops and flood control made several breaches in irrigation system retaining walls in lower Punjab to allow water to spread into larger areas. tely, the floodwaters spread through the country's fertile plains, damaging crops. As of Sep. 21, the death toll from this month's -spawned flooding and landslides topped 4,000 in India and Pakistan, according to press reports. In India, the flooding displaced or cted over 4 million individuals, with dozens of bridges damaged and large stretches of highway washed away, isolating numerous n Pakistan, some 3 million people were left homeless, and hundreds of thousands of farms were destroyed. Preliminary estimates the damage will exceed 50 billion rupees ($2.0 billion).

rtunately, rainfall has diminished since mid–September across much of the region, aiding rescue and rebuilding efforts. In ainfall increased across extreme southern India where abnormally dry conditions prevailed during August and early September. oon normally withdraws from Pakistan by early September, from western India by early October, and extreme southern India by ember.

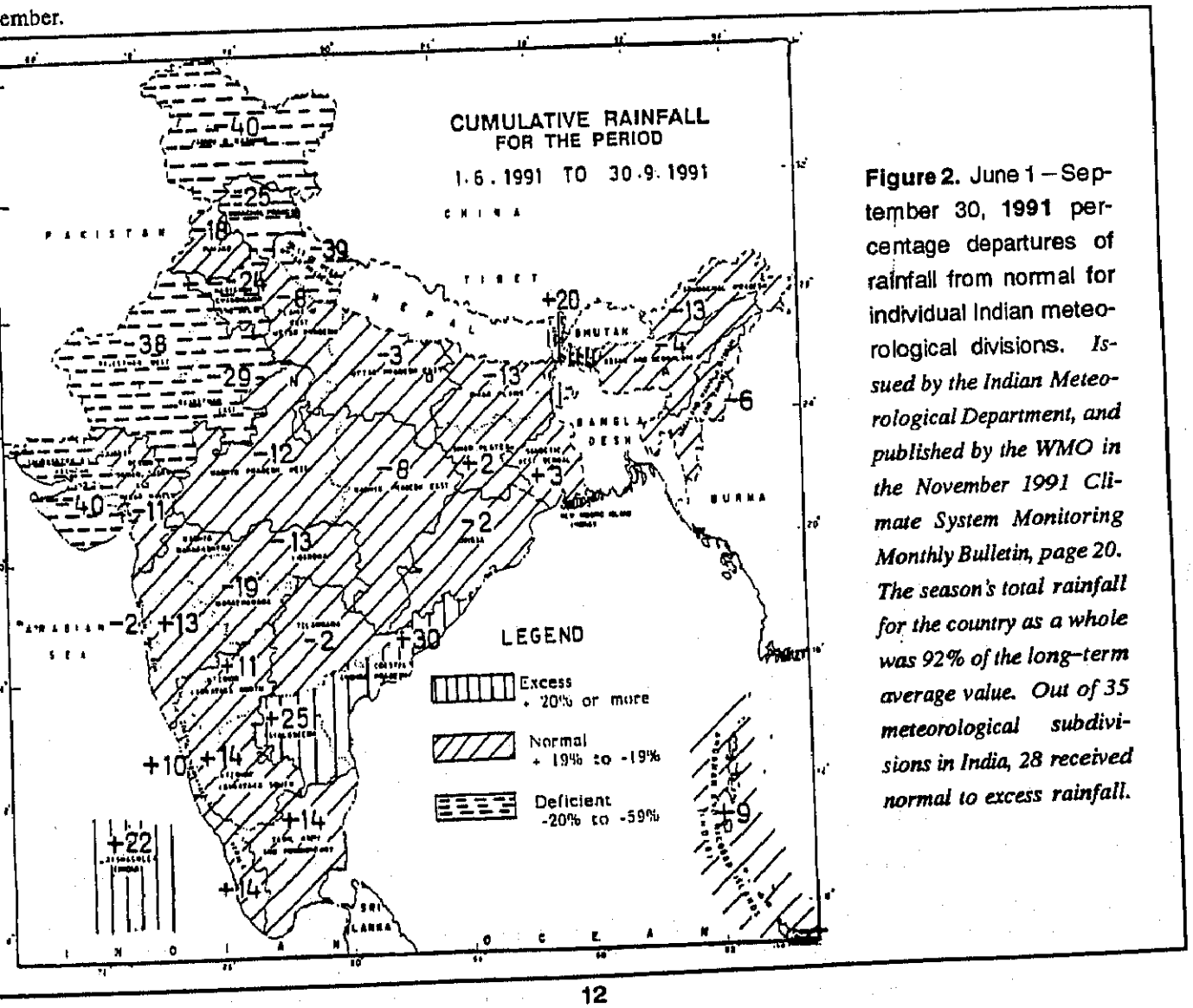



**Figure 2.** June 1 – September 30, **1991** percentage departures of rainfall from normal for individual Indian meteorological divisions. *Issued by the Indian Meteorological Department, and published by the WMO in the November 1991 Climate System Monitoring Monthly Bulletin, page 20. The season's total rainfall for the country as a whole was 92% of the long–term average value. Out of 35 meteorological subdivisions in India, 28 received normal to excess rainfall.*